



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/762,656	01/22/2004	John S. Wheat	8540P-000185	5141
27572	7590	09/12/2006	EXAMINER	
HARNESS, DICKEY & PIERCE, P.L.C. P.O. BOX 828 BLOOMFIELD HILLS, MI 48303			CHUO, TONY SHENG HSIANG	
			ART UNIT	PAPER NUMBER
			1745	

DATE MAILED: 09/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/762,656

Applicant(s)

WHEAT ET AL.

Examiner

Tony Chuo

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 July 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4, 6-31 and 33-39 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6-31 and 33-39 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 1/22/04 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Claims 1-4, 6-31, and 33-39 are currently pending. Claims 5 and 32 are cancelled. The amended claims 1, 13, 19, 31, 33-35 do not overcome the previously stated 102 and 103 rejections. Therefore, claims 1-4, 6-31, and 33-39 stand rejected under the following 102 and 103 rejections. This action is made FINAL as necessitated by the amendment.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-4, 6-10, 12-24, 27-31, 33-35, and 38 are rejected under 35 U.S.C. 102(b) as being anticipated by Dickman et al (US 2001/0049038). Regarding claims 1-2, 8-9, 13-14, 16-20, 23, 31, 33, 35, and 38, the Dickman reference teaches a fuel cell system and method of controlling power to a load supplied by a plurality of fuel cells comprising: a plurality of fuel cell stacks "76" connected in parallel and supplying a gross current for a load "80"; a plurality of inputs to and a plurality of output from the stacks; a contactor "100" between the stacks and the load; a current sensor "126" that senses a current generated by one or more of the stacks "76", a load managing control system "120" that controls the current to produce a maximum desired power output by

Art Unit: 1745

adjusting based on the load current, at least one parameter such as the flow of hydrogen gas affecting at least one of inputs and outputs to produce a desired current from one of the stacks wherein the controller uses sensed current from the load to determine the gross load current which is proportional to the total rated power output; and a controller that produces a desired current which is proportional to the maximum desired power output of the device through the load from at least one stack by adjusting, based on the gross load current, parameters affecting the anode input and cathode input (See Figure 10, paragraphs [0035],[0047],[0057],[0061],[0068]). In addition, it also teaches a stack assembly "77" comprising individual stacks "76" that collectively have a total rated power output that equals the maximum desired power output of the device (See paragraph [0042]). Therefore, the currents produced by the individual stacks are balanced according to the total rated power output of the stack assembly. In addition, it also teaches that if one of the stacks is removed from operation, the other stacks may continue to operate and thereby produce current "78" to satisfy at least a portion of the applied load from device "80" (See paragraph [0034]). Therefore, the determined load current is balanced among the remaining fuel cell stacks. The balancing is performed by adjusting the flow of hydrogen gas, air and/or cooling fluid to the stacks (See paragraph [0061]). In addition, a desired set-point for the current is obtained from determining the applied load to the stack assembly and current is regulated around that set-point using a power management module "81" with an inverter "85" (See paragraph [0064],[0068]). Examiner's note: The Dickman reference teaches load managing controls that is used to manage loads in a household.

Art Unit: 1745

Therefore, the current is regulated while the voltage remains constant. In addition, it is implicit from the teachings of Dickman et al that the sensor assemblies that include load sensors are current sensors because current sensors are necessary to determine the desired power output.

Regarding claims 3, 15, and 22, it also teaches controlling an input from the fuel cell stack comprising controlling temperature, pressure, flow rate, composition, state of actuation, load, etc (See paragraph [0057]).

Regarding claims 4 and 21, it also teaches a plurality of fuel cell stacks where each stack contains one or more fuel cells (See paragraph [0033]).

Regarding claim 6, it also teaches that each stack may operate independent of the other stacks so the controller controls a first current through the first stack and a second current through a second stack where the second current is controlled independently of the first current (See paragraph [0034]).

Regarding claims 7 and 34, it is well known in the art that the current of the stack is proportional to the size of the active areas of the stack. Therefore, if the active areas of the stacks are known, then the controller would control the first and second currents based on the set points proportional to active areas of first and second stacks.

Regarding claim 10 and 27, it also teaches determining the gross load current or total rated power output and adjusting the air flow to one or more of the stacks to meet the total rate power output (See paragraph [0061]). Therefore, the gross cathode stream mass flow rate would be determined by summing the air flows to each of the stacks.

Regarding claim 12 and 30, it also teaches that for loads less than the maximum, only that number of fuel cells necessary to meet the load demand are brought online and operational (See paragraph [0046]). Therefore, the total power necessary to meet the load demand is adjusted by adjusting the number of parallel stacks.

Regarding claims 24, it teaches controlling the input to a given stack by adjusting the flow of hydrogen gas, air, and/or cooling fluid to that stack (See paragraph [0061]). The input flows to the stack are adjusted based upon determining the stack load current and the desired current through the given stack.

Regarding claim 28, it also teaches interrupting the flow of hydrogen and air to a given stack so that the stack does not produce electric current (See paragraph [0061]).

Regarding claim 29, it teaches controlling the input such as flow rate to one or more of the stacks to control a plurality of currents through the plurality of stacks (See paragraph [0061]).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 11, 25-26, 36-37, and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dickman et al (US 2001/0049038) in view of Boehm et al (US 6461751). The Dickman reference is applied to claims 1-4, 6-10, 12-24, 27-31, 33-35,

Art Unit: 1745

and 38 for reasons stated above. However, the reference does not expressly teach using oxygen sensors in the cathode inlet and outlet to determine oxygen consumption and using the determined oxygen consumption to determine gross load current. The Boehm reference teaches determining the amount of oxygen consumed by the fuel cell to generate an electric current by controlling the oxidant stream mass flow rate and measuring the oxygen concentration from sensors in the cathode inlet and outlet (See column 12, line 50 to column 13, line 16). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Dickman fuel cell system to determine the gross load current by using the determined oxygen consumption in order to improve overall efficiency of a fuel cell system by reducing parasitic power consumption.

Response to Arguments

6. Applicant's arguments filed 7/28/06 have been fully considered but they are not persuasive.

The applicant argues that Dickman et al teaches voltage regulation and not current regulation. Dickman et al teaches load managing controls which regulate the current by using a power management module with an inverter. It also teaches using this system in a household application where the voltage is constant. Therefore, Dickman et al does teach current regulation. In addition, indirect current regulation does occur when voltage is regulated because Ohm's law establishes a direct relationship between V and I (i.e. $V=IR$).

The applicant argues that the sensor assembly of Dickman et al is not disclosed as being a current sensor. The load managing controls would require current sensors to regulate the current in order to determine whether the total power output of the fuel cell stacks meets the desired power output of the load.

The applicant argues that Dickman et al does not teach or suggest selectively adjusting the flow of the hydrogen gas, air, and/or cooling fluid to one or more stacks in response to a sensed or determined stack current value. Dickman et al does teach selectively adjusting the flow of hydrogen gas, air, and/or cooling fluid to one or more of the stacks. This adjustment of the flow of hydrogen gas and air would implicitly regulate the current that is produced by the fuel cell stacks to meet the current requirements of the applied load.

The applicant argues that the gross load current is not proportional to the total rated power. Burden is on the applicant to demonstrate that "gross load current" and "total rated power" are either not proportional and/or related. Regardless of whether the gross load current is proportional to the total rated power, the fuel cell system does produce a load current that is based on the desired current of the applied load.

The applicant argues that Dickman et al does not expressly teach using oxygen sensors in the cathode inlet and outlet to determine the oxygen consumption and using the determined oxygen consumption to determine the gross load current. Dickman et al does teach sensors that determine the composition of the fuel cell reactants which can be used to determine the load current. In addition, claims 11, 25-26, 36-37, and 39 are rejected under 35 USC 103(a) so therefore Dickman does not need to teach using

Art Unit: 1745

oxygen sensors to determine oxygen consumption and using the determined oxygen consumption to determine the load current.

Independent claims 1, 13, 19, 31, and 35 are wholly silent about: 1) current sensing being performed in the course of isolating a stack; 2) balancing of individual stack currents; and 3) selectively adjusting the flow of hydrogen, air, and/or cooling fluid. Thus, applicant's arguments are not commensurate in scope with the claimed invention.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

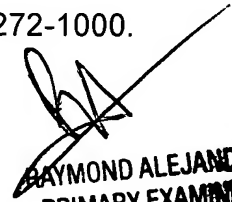
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571) 272-0717. The examiner can normally be reached on M-F, 8:30AM to 5:00PM.

Art Unit: 1745

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TC



RAYMOND ALEJANDRO
PRIMARY EXAMINER